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पोत निर्माण – समुद्री उपयोग के लिए 45 लीटर क्षमता के सुवाहय रासायनिक दमकल, झाग वाले – विशिष्टि

(पहला पुनरीक्षण)

Indian Standard

SHIPBUILDING — 45 LITRE CAPACITY CHEMICAL FOAM TYPE FIRE ENGINE, FOR MARINE USE — SPECIFICATION

(First Revision)

ICS 13.220.10

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BUREAU OF INDIAN STANDARDS
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NEW DELHI 110002

November 1997

Price Group 3

Marine Instruments and Safety Aids Sectional Committee, TED 20

FOREWORD

This Indian Standard (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Marine Instruments and Safety Aids Sectional Committee had been approved by the Transport Engineering Division Council.

Fire appliances fitted on board ships are covered by the Merchant Shipping Act, 1958 and IS 5507 : 1979 is not conformity with that. In addition, the method of fixing the fire appliances on board ships is different from those used ashore. Therefore, a need was felt to prepare a separate standard for 45 litre capacity foam type extingushers used on board ships. The chemical foam type extinguishers is operated by intermixing the inner and outer solution.

This standard was first published in 1976. Since then considerable experience has been gained by the manufacturers and users. This revision has been undertaken to bring it in line with the current practices. The salient features of this revision are the introduction of polyethylene for inner container and details for the mounting arrangements.

This standard generally incorporates the requirements under the Merchant Shipping Act, 1958 and the rules made thereunder. In addition, fire extinguishing appliances provided on board ships are subject to the approval by the Government of India under the Rules. Guidelines as per International Maritime Organization (IMO)'s resolution A-518 (13) of November 1983 has also been taken into consideration while finalizing this standard.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

SHIPBUILDING — 45 LITRE CAPACITY CHEMICAL FOAM TYPE FIRE ENGINE FOR MARINE USE — SPECIFICATION

(First Revision)

1 SCOPE

1.1 This Indian Standard lays down the requirements regarding material, shape, construction, chemical charge, anti-corrosive treatment and tests for 45 litre capacity chemical foam type fire engine mounted on trunnion or trolley for marine use.

2 REFERENCES

2.1 The following standards contain provisions which through reference in this text, constitute provision of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this strandard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

IS No.	*Title*
5 : 1994	Colours for readymixed paints and enamels (*fourth revision*)
210 : 1993	Grey iron castings (*fourth revision*)
291 : 1989	Naval brass rods and sections for machining purpose — Specification (*third revision*)
318 : 1981	Leaded tin bronze ingots and castings (*second revision*)
319 : 1989	Free-cutting brass bars, rods and sections — Specification (*fourth revision*)
320 : 1980	High tensile brass rods and sections (other than forgings stock) (*second revision*)
410 : 1977	Cold rolled brass sheet , strip and foil (*third revision*)
581 : 1976	Vegetable tanned hydraulic leather (*second revision*)
819 : 1957	Code of practice for resistance spot welding for light assemblies in mild steel
1079 : 1994	Hot rolled carbon steel sheet and strip (*fifth revision*)
1161 : 1979	Steel tubes for structrual purposes (*third revision*)
1261 : 1959	Code of practice for seam welding mild steel
1323 : 1982	Code of practice for oxy-acetylene welding for structural work in mild steel (*second revision*)
2190 : 1992	Code of practice for selection, installation and maintenance of first-aid fire extinguishers (*second revision*)
2643 (Part 1) : 1975	Dimensions for pipe threads for fastening purposes : Part 1 Basic profile and dimensions (*first revision*)
2932 : 1993	Enamel, synthetic, exterior (a) undercoating, (b) finishing (*second revision*)
3203 : 1982	Methods of testing local thickness of electroplated coatings (*first revision*)
3537 : 1966	Readymixed paint, finishing, interior for general purposes, to Indian Standard colours No. 101, 216, 217, 219, 275, 281, 352, 353, 358 to 361, 363, 364, 388, 410, 442, 444, 628, 631, 632, 634, 693, 697, white and black
4989	Specification for foam concentrate (compound) for producing mechanical foam for fire fighting:
(Part 1) : 1985	Protein foam (*second revision*)
(Part 2) : 1984	Aqueous film forming foam (AFFF)
5382 : 1985	Rubber sealing rings for gas mains, water mains and sewers (*first revision*)

IS No.	*Title*
5490 (Part 4) : 1979	Specification for refills for portable fire extinguishers and chemical fire engines : Part 4 For foam chemical fire engines (*first revision*)
5507 : 1979	Specification for 50-litre capacity chemical fire engine, foam type (*first revision*)
7328 : 1992	High density polyethylene materials for moulding and extrusion (*first revision*)
9595 : 1980	Recommendation for metal arc welding of carbon and carbon manganese steels

3 CAPACITY

3.1 The total liquid capacity of the inner and outer containers, when filled to the specified level, shall be 45 litres.

4 PRINCIPLE

4.1 Chemical fire engine is operated by mixing the solutions in the inner and outer containers by lifting the seal of the inner container by unscrewing the threaded spindle fitted to the cap and attached to the sealing disc, in the upright position and then placing the engine horizontally.

5 MATERIAL

5.1 Mild Steel Sheets

Mild steel sheets used for the body shall be not less than 3.15 mm thick and shall conform to Grade D of IS 1079.

5.2 Brass Sheets

Brass sheets shall be used for the inner container and shall be not less than 1.6 mm thick and shall conform to alloy CuZn 37 of IS 410.

5.3 Polyethylene

The high density polyethylene used for inner container shall conform to IS 7328.

5.4 Leaded Tin Bronze

Leaded tin bronze used for neck ring shall conform to Grade 2 of IS 318.

5.5 Extruded Brass Sections

Extruded brass sections used for spindle shall conform to Grade 2 of IS 291 or Type I of IS 319.

5.6 Rubber or Leather Used for Washer

5.6.1 Rubber shall conform to the requirements in respect of hardness, tensile strength and elongation at break before and after ageing as mentioned for Type 1A of IS 5382. It shall also be acid/alkali resistant when tested as under:

> When two pieces, each of 2.5 cm cut from any portion are dipped separately in 20 percent sulphuric acid and 5 percent of sodium hydroxide solution for 30 min, there shall be no sign of corrosion or damage.

5.6.2 Where leather is used, it shall be buffalo leather properly curried and shall conform to IS 581.

5.7 Cast Iron

The grip wheel shall be made out of cast iron conforming to IS 210.

5.8 Brass

Brass used for nozzle, hose union assembly, grip wheel retaining nut washer, top plunger washer spindle, spindle sealing assembly, inner container water retainer and its nuts shall conform to IS 320.

5.9 Hose Pipe

The discharge rubber hose pipe shall have a bore of not less than 20 mm and a length of not less than 3 m. It shall have a minimum bursting pressure of 3.2 MN/m^2 (32 kgf/cm^2). The hose pipe shall be capable of 90° bend on the length without kinking or cracking in the unpressurised state at 20° to 50°C before and after carrying out the discharge test.

6 SHAPE

6.1 The shape of the body of the chemical foam engine shall be cylindrical having an outside diameter of 300 ± 15 mm (*see* Fig. 1).

7 CONSTRUCTION

7.1 General

The top end (dome) and the bottom end (dish) of the body shall be without reverse of curvature and shall be dished outwards (convex) to a radius not exceeding the outside diameter of the body to which they are to be fixed or of which one or other forms a part, if solid drawn therewith (*see* Fig. 1).

7.2 Body

The construction of the body shall be of welded construction. Guard to hold the inner container in vertical position shall be welded inside the body at the bottom dish so that when the body is tilted to horizontal position during operation, the inner container does not get unduly strained due to its weight and weight of the charge held in it.

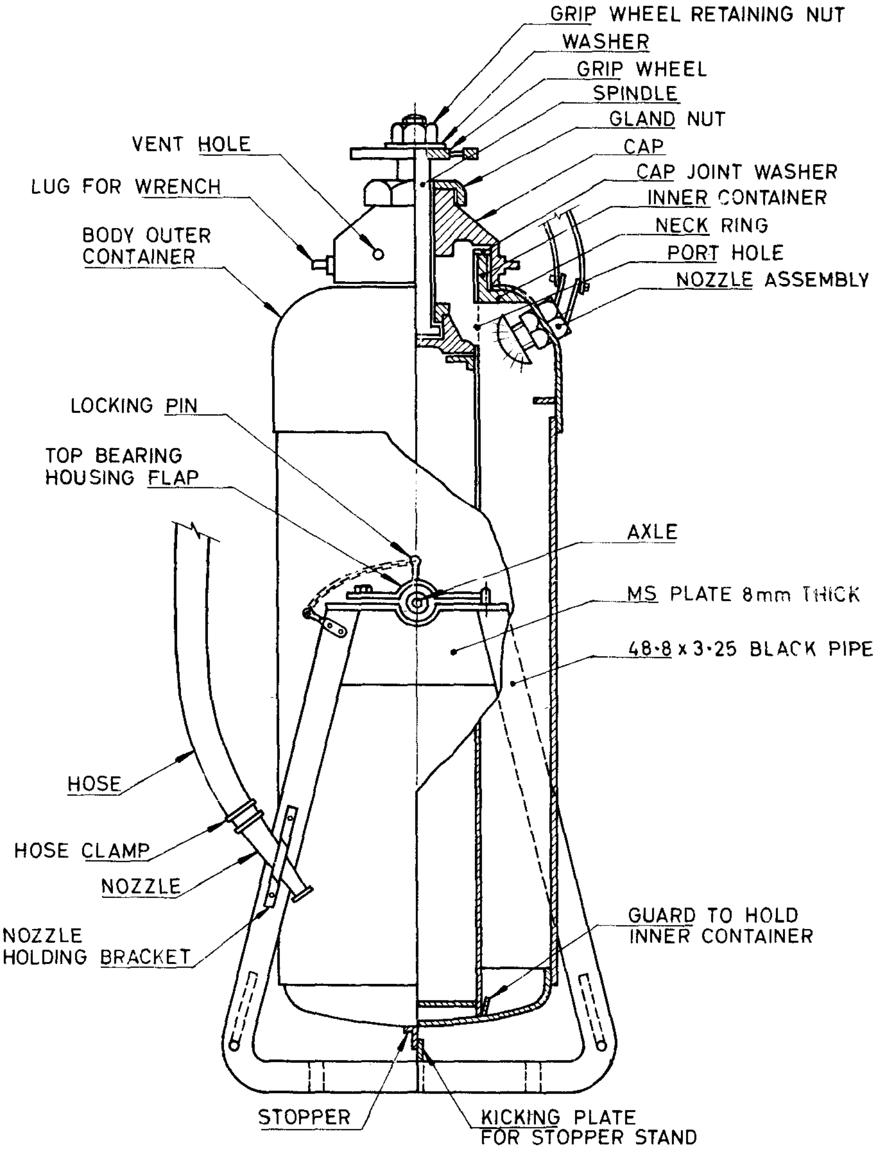

FIG. 1 TYPICAL DIAGRAM OF 45 LITRE CAPACITY CHEMICAL FOAM ENGINE FOR MARINE USE

7.2.1 *Construction*

The welded construction shall be one of the types given below:

a) Oxy-acetylene welding shall conform to the requirements specified in IS 1323.

b) Resistance welding:

   i) Spot welding (for attachment of fittings only) shall conform to IS 819.

   ii) Stitch welding shall conform to the requirements specified in IS 819.

   iii) Steam welding shall conform to the requirements specified in IS 1261.

c) Metal arc welding shall conform to IS 9595.

7.3 Inner Container

The inner container shall be of one piece construction having an outside diameter of not less than 100 mm. The opening at the mouth of the inner container shall be such as to receive the seal when applied. The inner container shall have sufficient holes such that the total area of these holes is not less than the cross section of inner container.

7.4 Neck Ring

The neck ring shall provide a clear opening of not less than 115 mm. It shall have parallel screw threads according to IS 2643 (Part 1) with class A tolerance for an effective length of not less than 25 mm for the attachment of the cap. The neck ring shall be firmly secured to the body either by riveting and soldering or brazing. If it is secured to the body by a riveted and soldered flange, it shall be riveted there to by an adequate number of rivets of not less than 5 mm diameter each.

7.5 Cap

The cap shall be screwed for fixing to the neck ring in the body for not less than 25 mm effective length. The cap shall be provided with parallel thread according to IS 2643 (Part 1). Four equispaced holes of not less than 2.5 mm dia each shall be drilled through the threads of the cap to form vents. The centre of the vent holes shall be 6.5 mm from the face of the cap joint washer.

7.5.1 *Spindle*

A threaded spindle, carrying a metal disc with facing of rubber at its lower end and a hand wheel at its upper end, shall be fitted through a suitable gland and screwed fitting in the centre of the cap.

7.5.2 The spindle shall be machined from an extruded brass rod. Its lower end shall be fitted to a metal disc in such a manner that with the disc pressed against its seat, the spindle could be tightened.

7.5.3 *Metal Disc*

The lower end of the spindle shall be fitted to a metal disc in such a manner that with the disc pressed against its seat, the spindle could be tightened. The metal disc shall be faced with renewable rubber facing on its underside. The design of the disc and facing shall be such that, when fully seated on the opening of the inner container, it shall make a watertight closure.

7.5.4 *Hand Wheel*

The hand wheel shall have an outside diameter of not less than 100 mm, and shall have three or more radial spokes meeting at the centre. A square hole shall be made in the centre to fit a corresponding section on the spindle. The wheel shall be retained in position by a suitably designed crown nut.

7.6 Liquid Level Indicator

The specified level of the solution in the body shall be indicated on the exterior of the body and shall also be permanently indicated in the interior, or means shall be provided to demonstrate that the solution level is correct.

7.7 Nozzle

The design of nozzle and the area of orifice shall be such that when the chemical foam engine charged in a correct manner with the charges conforming to IS 5490 (Part 4) is operated in still air under normal temperature conditions of 27 ± 2°C, the solution shall be expelled in the form of a jet finished foam which shall maintain an effective throw of not less than 10 m for the minimum periods of time given in Table 1, provided that 95 percent of the solution shall be discharged from the chemical fire engine within the maximum specified period.

7.7.1 The finished foam or produced foam expelled shall give a minimum expansion ratio of 1 : 7 when determined in accordance with the test method given in IS 4989 (Part 1) or IS 4989 (Part 2) or alternatively the layer of finished foam shall cover an area of 4.5 m^2 to a depth of 5 cm.

Table 1 Discharge Characteristics of Chemical Fire Engine, Foam Type

(*Clauses* 7.7 *and* 12.2)

Capacity of Chemical Fire Engine	Minimum Period During Which the Jet shall be Maintained at not less than 10 m	Maximum Period Discharge Minimum 95 Percent of the Solution Content
l	s	s
45	90	120

7.8 Test Connections

Provision shall be made for an internal pressure test on the body. For this purpose, the union to which the hose is connected shall be screwed in accordance with G 3/4 of IS 2643 (Part 1).

7.9 Expansion Space

A space shall be provided in the body above the liquid level. It shall be of sufficient volume to ensure that when the discharge nozzle is temporarily closed and the chemical engine operated at a temperature of 27 ± 2°C, the pressure extered shall not exceed 1.4 MN/m^2 (14 kgf/cm^2). The temperature in this case shall be the temperature of the solution and not the atmospheric temperature.

NOTE — This requirement may be satisfied by providing an air space of not less than 5 percent of the internal volume of the body.

8 STAND/MOUNTING ARRANGEMENT

8.1 The chemical fire engine shall be mounted on trunnions on a suitable stand according to details given in Fig. 1. The fitting shall ensure that the lowest part of the body remains not less than 10 cm above the ground/floor when it is in vertical position.

8.2 The stand shall be made of black pipe having 48.8 mm O D and 3.25 mm wall thickness conforming to IS 1161. A suitable nozzle holding bracket shall be welded on the framework. Suitable arrangement to lock the extinguisher in vertical position shall be provided. A kicking plate for stopper stand shall be provided. A stopper shall be welded in the bottom dish of the body of extinguisher. Mild steel axle of dia 25 mm (*Min*) shall be welded to the body on both the sides.

8.3 The mounting arrangement shall be such that it shall be perfectly stable and balanced with the fully charged engine mounted on it in vertical position. The arrangement shall be such that it shall be possible for one fireman/sailor to tilt the body horizontally and rock it or swing it during operation without overturning the extinguisher.

8.4 The chemical fire engine can be mounted on trolley with arrangements as indicated in **8.1, 8.2** and **8.3**.

9 CHEMICAL CHARGE

9.1 The chemical charge shall conform to IS 5490 (Part 4). The *p*H of the expelled foam shall be between 6.5 to 7.5, that is, it shall be nearly neutral.

10 ANTI-CORROSIVE TREATMENT

10.1 The components of the chemical foam engine shall be treated as specified in Table 2 so that no part of the surface of components without anti-corrosive treatment is exposed.

Table 2 Anti-Corrosive Treatment

(*Clause* 10.1)

Sl No. (1)	Component (2)	Material (3)	Coating (4)
i)	Body	Mild steel	Lead-tin alloy
ii)	Inner container	Brass sheets	Lead-tin alloy internally and externally
iii)	Sealing disc	Brass	do
iv)	Spindle	Extruded brass section	Lead-tin Alloy

10.1.1 On internal and external surface of the body, anti-corrosive treatment shall be applied either by hot dipping process or by electrolytic process to a thickness of not less than 0.012 mm. The thickness of the coating shall be measured by any of the methods given in IS 3203. There shall be uncoated area, both internally and externally.

11 WORKMANSHIP AND FINISH

11.1 Each chemical fire engine, including the wheeled carriage, shall be painted with fire red colour conforming to shade No. 536 of IS 5. The paint shall conform to IS 2932.

11.2 Each chemical fire engine shall be cleaned and painted with one coat of primer and two coats of enamel paint of 'fire red' conforming to shade No. 536 of IS 5. The paint shall conform to IS 3537.

12 TEST REQUIREMENT

12.1 Every fire engine complete with cap, inner container, with the threaded spindle fully unscrewed when constructed shall be capable of withstanding an internal hydraulic pressure of 2.5 MN/m^2 (25 kgf/cm^2) for a continuous period of 5 min without leakage of visible distortion. This test shall be carried out before the body is painted. For this purpose the hose of extinguisher shall be disconnected and connection shall be made with testing connection (*see* **7.8**). The rubber discharge hose shall be separately tested to ensure that it has a bursting pressure of minimum 3.2 MN/m^2 (32 kgf/cm^2).

12.1.1 In any test of destruction which may be called for ultimate failure shall not occur at a pressure of not less than 3.5 Mn/m^2 (35 kgf/cm^2).

12.2 Every fire engine shall satisfy the performance requirements specified in **7.7, 9.1** and Table 1.

12.3 Every chemical fire engine shall be subjected to the performance test laid down in **12.1** and **12.2**. After these tests, its body shall be thoroughly cleaned with water free from chemical solution. The water shall then be completely drained off and the interior of the body shall be examined after 24 h. It shall be free from all traces of rust. Superficial rust stains which could be rubbed off with a dry cloth may be ignored.

13 MARKING

13.1 Each fire engine shall be clearly and permanently marked with the following information:

a) Manufacturer's name or trade-mark;

b) Year of manufacture;

c) The words 'Chemical Fire Engine, Foam Type for Marine Use' in prominent letters;

d) The capital lettler 'B' indicating the suitability of the fire engine for class 'B' fires as laid down in IS 2190. The letter 'B' shall be of size 75 mm printed in black colour centrally contained in a square of 14 cm size. The square shall be coloured fire red or cream lemon yellow if the body be painted pale cream or fire red respectively. The words 'Do not use on energised equipments fires' may also be added;

e) The nominal charge of the liquid in litres;

f) The liquid level to which the chemical engine is to be charged;

g) The words ' AFTER DISCHARGE, FLUSH OUT CAREFULLY WITH CLEAN FRESH WATER USING AT LEAST TWO CHANGES AND REFILL IMMEDIATELY' in prominent letters;

h) A declaration to the effect that the chemical engine has been tested to a hydraulic pressure of 2.5 MN/m^2 (25 kgf/cm^2);

j) Instructions regarding the operation of the appliances in clear and bold letters;

k) Temperature range over which the engine will operate satisfactorily; and

m) Approval details, if any.

13.1.1 The chemical fire engine may also be marked with the BIS Certification Mark.

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